

# Space News Roundup

Vol. 24 No. 5

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National Aeronautics and Space Administration



**New look at an old breccia**

Among the visitors to the Lunar Sample Processing Laboratory this week was Dr. Gerald Wasserburg of CalTech (center), shown here viewing a breccia sample obtained during Apollo 16. Tours of the lab, which were held for scientists during the Lunar and Planetary Science Conference, were unusual in several respects, not least of which the fact that the samples had recently been sliced in the lab, presenting new surfaces for study. Wasserburg, an advisor to NASA throughout the Apollo program, has been a leading figure in the development of clean room techniques and equipment for studying lunar samples.

## Discovery sustains no structural damage

The Orbiter *Discovery* sustained no structural damage to its port side forward payload bay door when an access platform struck the vehicle in an accident March 8.

Gary Sutherland, 35, of Cocoa, a Lockheed Space Operations Co. mechanical technician, sustained a broken left fibula and a broken left tibia in the accident.

*Discovery* was in the Orbiter Processing Facility Bay 2 with payload bay doors closed in preparation for a move to the Vehicle Assembly Bldg. *Discovery* is slated as the vehicle for the next Shuttle mission, STS 51-D.

Repairs to the vehicle will be made in the Orbiter Processing Facility. Officials said repairs should take one week to ten days, and a launch date will not be chosen for 51-D until a day or two after *Discovery* has been moved to the VAB and mated with the external tank and solid rocket boosters.

The accident occurred in this way: located above each orbiter in the OPF are two rolling bridge cranes. Each crane has two payload bay access platforms, also known as buckets, attached to it. One of the buckets on one of the rolling bridges was in use and the other was raised and stowed.

At one point, when the rolling beam started to move in order to translate the unstowed bucket, the stowed bucket began to descend. The bucket continued to descend until it contacted a 45-degree platform guy-wire and then followed that wire down until it struck the Orbiter. The bucket also struck Sutherland, who was taken to Jess Parrish Memorial Hospital for treatment.

Damage to *Discovery* was in the form of two penetrations into the payload bay door about three feet apart, reflections of two corners of the access bucket. The larger penetration is about 4 to 5  
(Continued on page 2)

## Next two flights to be combined

The next two planned Space Shuttle missions have been combined following problems discovered in the second Tracking and Data Relay Satellite, NASA announced last week.

The combined mission, to be known as STS 51-D, incorporates features of the previously scheduled 51-E and 51-D flights. The crew will consist of Commander Karol J. Bobko, Pilot Donald E. Williams, Mission Specialists M. Rhea Seddon, Jeffrey A. Hoffman and S. David Griggs, and Payload Specialists Charles D. Walker of McDonnell Douglas and Utah Senator E.J. "Jake" Garn.

The launch date for the mission will be in late March or early April.

Problems associated with the TDRS-B satellite prompted NASA to cancel the 51-E mission, which had been scheduled to launch March 7. TDRS-B and the Anik-C (Telesat-I) were the major cargos scheduled to go up on 51-E. Under

the new plan, Anik-C will be combined with the Syncom IV satellite already manifested for 51-D. TDRS-B will be returned to the factory for modifications, and the retrieval of the Long Duration Exposure Facility, which had been planned for 51-D, will be delayed until sometime in 1986.

There will also be a switch in Orbiters. *Challenger*, which was to have flown the 51-E mission, was rolled back from the pad and will now be prepared for the April Spacelab-3 mission. *Discovery* will be used for the 51-D flight.

Tests performed Feb. 27 and 28 confirmed a problem in the TDRS system which made a launch of TDRS-B unacceptable without modifications, NASA said. Under certain operational conditions, the timing circuits could cause errors in the system switching sequences, and these errors would in turn interrupt user support. Although procedures  
(Continued on page 2)

## Meanwhile, out in the Solar System...

*Chronicling the cosmic neighborhood at the 16th Lunar and Planetary Science Conference*

Materials returned from the Solar Max satellite following the STS 41-C repair mission have given scientists here a unique opportunity to study the abundance of debris and meteoroids in low Earth orbit.

That study by a team of researchers at JSC comes amid a wealth of information which was presented throughout the week at the 16th Lunar and Planetary Science Conference. Samplings from the conference proceedings are presented on Page 3 of this issue.

In 1978, a theoretical study by Donald J. Kessler of JSC predicted that in certain regions of Earth orbit, manmade debris would soon surpass natural debris, such as meteoroids, for sizes less than one centimeter. The returned materials from Solar Max have added a valuable new source of information to that data base.

Past studies in this field have examined such objects as Skylab

experiment S-149, the windows from Apollo command modules and a window on the Orbiter *Challenger* which sustained a 2 millimeter high velocity impact crater during STS-7. (The crater had traces of titanium and aluminum, evidence of having been formed by a very small manmade object.)

The problem with those experiments was that materials studied either had short exposure times, no conclusive technique to differentiate debris from meteoroids, or an altitude or duration of flight where lesser amounts of debris might be expected.

Solar Max, however, was in orbit for 50 months at a good representative altitude for studying the debris in space. About 160 craters were found to have penetrated the surfaces studied here at JSC. "Based on very limited calibration data," the authors said, "this is a factor of

two to five above what would be expected from the meteoroid flux alone."

To date, researchers have characterized the craters found on the Solar Max material in four categories: meteoritic material, paint particles, aluminum droplets and waste particles. One impact was determined to have been caused by a waste particle from the Shuttle's waste management system.

The paper, "Examination of Returned Solar-Max Surfaces for Impacting Orbital Debris and Meteoroids," was prepared by Donald Kessler, Herbert Zook, Andrew Potter and Dave McKay of JSC; Uel Clanton of the Department of Energy; J. L. Warren and L. A. Watts of Northrop's Houston operation; L. S. Schramm, S. J. Wentworth and G. A. Robinson of Lockheed's Houston operation; and R. A. Schultz of Purdue University.

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The Sudbury geologic structure in Ontario, Canada has long attracted the interest of many generations of geologists. It is possibly scientifically the most intriguing and at the same time economically the most profitable igneous rock body on this planet. The Sudbury Complex is famous as the world's largest single supplier of nickel. . . The value of different minerals produced from Sudbury is indeed remarkable. For example, in 1981, Sudbury supplied nearly 19 percent of the world's total nickel production, and before 1940, 80 percent of the world's nickel market was captured by Sudbury. The reserves of nickel at Sudbury is estimated sufficient for continued production into the twenty first century. . . It is our proposition that these heterogeneous groups of rocks were impact-melted. . .  
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—B. E. Faggart, et al. "Nd-isotopic Evidence for the Origin of the Sudbury Complex by Meteoritic Impact," a paper suggesting that one of the richest ore concentrations on Earth was formed by the intense heat caused by the impact of a large meteorite around two billion years ago.

## Bulletin Board

### AIAA call for papers extended

The deadline for submission of abstracts for the 10th Annual Technical Symposium of the Houston Section of the American Institute of Aeronautics and Astronautics has been extended to April 1. The theme for the symposium is "Space Shuttle—Space Station Operations and Technology." The symposium will be held May 10 at the University of Houston-Clear Lake. Abstracts should be 250 words or less and should be sent to Walter Lueke, Code ES361, x3481, by close of business April 1.

### Bach celebrations to be held

Both the Houston Festival and the Pasadena Philharmonic will hold concerts in March to celebrate the 300th birthday of Johann Sebastian Bach. The Texas Chamber Orchestra and the Houston Symphony Chamber Orchestra are collaborating in the Bach Birthday concerts March 23 as part of the Houston Festival Activities. The concerts will begin at 2 p.m. and 7 p.m. at Christ Church Cathedral, 1117 Texas at Fannin. Tickets for the afternoon concert are \$10 and tickets for the evening concert are \$12. Tickets can be ordered by calling 227-ARTS or at the Houston Ticket Center in Jones Hall and at all Ticketron outlets. The Pasadena Philharmonic and Chorale will celebrate the birthday at 8 p.m. March 30 in Slocumb Auditorium at San Jacinto College central campus on Spencer Hwy. Tickets are \$4, or \$2 for senior citizens and students. For more information on the Pasadena Philharmonic offerings, call 640-3358.

### NASACOM 64 club to hold dinner

The NASACOM 64 Commodore Computer Club will hold a banquet for members beginning with a social hour at 6:30 p.m. March 29 at the Gilruth Recreation Center. The menu will be a Texas-style BBQ with all the trimmings, and the speaker will be Jim Butterfield. Tickets are \$7 per person and are available to club members only at the club's March 20 meeting.

### Brown bag schedule listed

Upcoming topics for the weekly JSC Astronomy Club brown bag seminars include discussions on Mars, Venus and the Moon. The seminars are held every Wednesday from noon to 1 p.m. in Bldg. 31, Conference Rm. 193. On March 27, Bruce Bills of the Lunar and Planetary Science Institute will discuss gravity, topography and rotation of Venus. On April 3, Stephen Clifford of LPI will discuss water on Mars. April 10 will be devoted to a discussion of the Gamma Ray Observatory by D.C. Stager of TRW. On April 17, Larry Friesen of McDonnell Douglas will talk about the uses of a lunar base for the study of planetary geology. April 24 is currently scheduled as an open discussion meeting. For more information, call Al Jackson at CSC, 280-2285.

## Gilruth Center News

Call x3594 for more information

**Shorthand** — Learn the basics of reading and writing Gregg shorthand, as well as increasing your speed, in this six-week course which meets from 5:30 to 8 p.m. beginning March 27. The cost is \$85 per person.

**Exercise class** — These fitness sessions, open to males and females, meet Monday through Friday from 6:45 to 7:45 a.m. or from 5:15 to 6:15 p.m. The cost is \$20 per person.

**Ladies weight training** — This popular course runs for four weeks beginning March 18. The class meets Mondays and Wednesdays from 7 to 8 p.m. at a cost of \$20 per person.

**Beginning computer** — Learn about hardware and software, bits, bytes and boxes in this course which introduces you to the computer age. The six-week class meets Wednesday nights from 6 to 8 p.m. beginning March 20. The cost is \$30 per person.

**Beginning jitterbug/swing** — In this popular course, beginners learn how to partner dance to many types of music. This six-week course meets from 7:30 to 9:30 p.m. beginning April 5. The cost is \$30 per person and limited space exists.

**Tennis lessons** — A beginning tennis class which begins Tuesday, April 9 will concentrate on fundamentals. An intermediate class will begin Wednesday, April 10 and will focus on improving net play. Both classes meet from 5:15 to 6:45 p.m. and run for eight weeks.

**Beginning French** — Learn basic words and phrases by the audiovisual method in this class which meets from 7:30 to 9:30 p.m. beginning March 18. The six-week class costs \$30 per person.

**Spanish lessons** — Get to know Spanish through conversation in a relaxed atmosphere in this class, which introduces the beginning student to basic pronunciation and grammar. The class meets Wednesdays from 7:30 to 9:30 p.m. beginning March 20. The cost is \$30 per person.

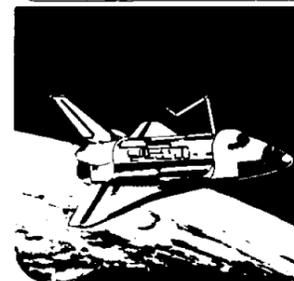
**Bicycle repair** — Get a basic overview of bicycle repair in this two-week course which meets Thursdays from 7:30 to 9:30 p.m. beginning March 21. The cost is \$6 per person.

## Lost and Found

**Lost** — 1985 Clear Creek High School class ring, silver with blue stone, initials JEH, \$25 reward for return. Call Jack, x2285.

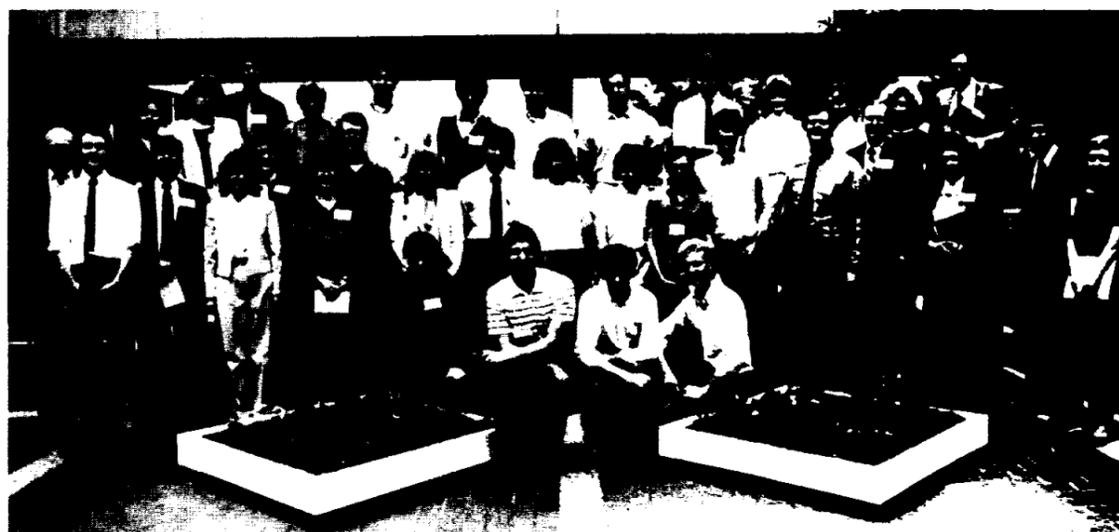
NASA  
Lyndon B. Johnson Space Center

## Space News Roundup



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Editor ..... Brian Welch  
Editorial Assistant ..... Tina Griego



Space Shuttle Student Involvement Project winners from Region 8 are shown here during a visit to JSC the first week of March. The 20 students presented proposals for experiments that might one day fly on the Shuttle. A committee will select ten of the best proposals from 200 national winners.

## Charon eclipsing Pluto

A rare alignment of Pluto and its only known satellite, Charon, in which they take turns eclipsing each other, is giving astronomers a new tool to study the solar system's most distant planet.

Astronomers at NASA's Jet Propulsion Laboratory, the University of Hawaii, the University of Arizona and the University of Texas are observing Charon as it alternately moves in front of and then behind Pluto in a rare series of eclipses that occur every 124 years or twice in each orbit of the sun.

Very little is known about Pluto and even less about Charon. No one knew, for example, when or even if the five-year-long series of eclipses would begin. This is the first opportunity to observe the eclipse series since Pluto was discovered in February 1930. So that they would not miss any of the earliest events, the astronomers established an observing network. The network is made up of astronomers at McDonald Observatory in Texas, the University of Arizona observatories, Palomar Observatory in California and Mauna Kea Observatory in Hawaii.

Each time Charon passes between Pluto and Earth, a portion of the surface of Pluto is blocked from view, resulting in a dimming

of the combined light from the two bodies. And when Charon moves behind Pluto, their roles are reversed.

Measurements of the times, durations and changes in brightness of the events will allow astronomers to calculate the masses, diameters and densities of both Pluto and Charon. A more accurate estimate of the density of Pluto and Charon would allow astronomers to develop models of what the planet and satellite are made of. Estimates of Pluto's density now have an uncertainty of 50 percent, which is not accurate enough to derive information on its composition. Pluto's density is thought to be about that of water. That would make it the lowest-density planet known that has a solid surface.

The new measurements indicate that the combined brightness of Pluto and Charon diminishes by four percent during the eclipses. The dimming lasts about two hours and is superimposed on a 30 percent brightness change that occurs over a 6.4-day period. The longer change in brightness happens because one hemisphere of Pluto is 30 percent brighter than the other.

The first to see and measure an eclipse of Pluto by Charon was Dr. Edward Tedesco of JPL, while

observing with Dr. Bonnie Buratti, also of JPL, at Palomar on Jan. 16, 1985. On Feb. 17, Richard Binzel observed another eclipse from the University of Texas' McDonald Observatory. And Dr. D.J. Tholen observed a third eclipse on Feb. 20 from the Mauna Kea Observatory.

Astronomers discovered Charon in 1978. Charon's orbital motion around Pluto led the astronomers to realize that Pluto is tipped on its side, in much the same way as Uranus, so that Pluto alternately points its north and then its south pole toward the sun.

Pluto circles the sun in a highly elliptical orbit that moves inside of Neptune's orbit and then far beyond it. It has been inside the orbit of Neptune since 1979 and will be there until 1999. Its average distance from the sun is 4 billion miles, almost 40 times greater than Earth's. Pluto was discovered in February 1930 by Clyde Tombaugh at the Lowell Observatory. Charon was discovered in 1978 by James Christy at the U.S. Naval Observatory. Because it circles the sun only once in 248 years, Pluto hasn't completed one orbit since its discovery. Their great distance and relatively small sizes make Pluto and Charon among the most difficult objects to observe in the solar system.

## Discovery damage not severe

(Continued from page 1)

inches long and about 2.5 to 3 inches deep. The other penetration is about the same length but shallower. A smaller depression is located between the two penetrations.

An assessment done over the weekend of March 9 and 10 showed no structural damage to the doors and indicated that the frames and stringers supporting the graphite epoxy/honeycomb panels of the door were undamaged. The radiators within the doors also were unharmed. The damaged material, measuring approximately one square foot in

each puncture area, will be removed. The removed areas will be replaced with one-square-foot graphite doublers (or plugs) now being fabricated at the Rockwell plant in Tulsa, Okla. Following repair of the graphite epoxy/honeycomb, the Advanced Flexible Reusable Surface Insulation (AFRSI) must be reinstalled and functional checks of the payload bay door conducted in preparation for rollout to the VAB.

A mishap investigation board was chartered the day of the accident and held its first meeting at 4:30 p.m. EST that day. The board, chaired by John J. Neilon, Director of Cargo Projects Manage-

ment at KSC, met to establish procedures prior to taking statements and reviewing other evidence. All paperwork and evidence associated with the accident have been impounded by the board.

Other board members are B.H. Childers and T.D. Greenfield. Bruce Jansen was appointed safety advisor and recorder to the board. Mark Schlomer is legal advisor and Charles H. Neubauer, NASA Headquarters, is observer to the board.

The Agency said it would have no additional information on the accident until the board completes its investigation and has reported its findings.

## 51-D is next flight

(Continued from page 1)

have been developed to satisfactorily operate the TDRS-A spacecraft now in orbit, officials said this approach was not acceptable for multiple spacecraft use.

National Space Transportation System Program Manager Dr. Glynn S. Lunney said the TDRS-B satellite would be returned to the manufacturer for a redress of the problem, and that a fix "would be measured in months." He said the status of the TDRS-C satellite, to be launched this fall, remains unchanged.

"The schedule hit we are taking with the TDRS-B problem is essentially an immediate one," Lunney said. "The manifest is unchanged

for flights which are scheduled to come after 51-D."

The originally announced 51-D crew of Commander Daniel C. Brandenstein, Pilot John O. Creighton and Mission Specialists Shannon W. Lucid, John M. Fabian and Steven R. Nagel will be reassigned to a future mission.

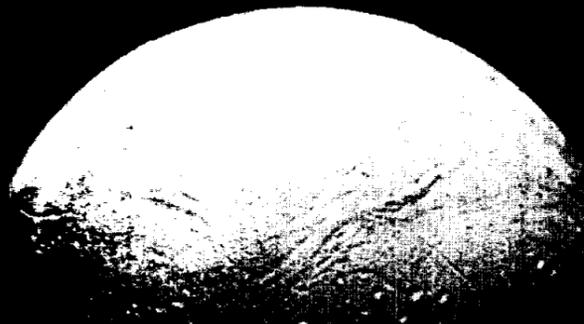
Payload Specialist Patrick Baudry of France, originally scheduled to fly on 51-E, has been reassigned to STS 51-G, now set for launch in June. That decision was made with the approval of the Centre National d'Etudes Spatiales, CNES. One advantage of switching Baudry to 51-G is the longer flight duration—seven days instead of four for 51-E, which allows for obtaining more data.

NASA also will provide an ad-

ditional opportunity to Hughes for the flight of one of their payload specialists to make up for the lost opportunity on 51-D. The fluid transfer experiments which Hughes payload specialists will perform are designed to aid Hughes in the refinement of satellite design. NASA set STS 51-I—an early August mission—as the next opportunity to a Hughes payload specialist.

In announcing crew assignment changes, NASA said a primary factor in the decision making was the preservation of crew training schedules for upcoming missions. It was necessary to fly Bobko's crew now since he is also in training for the 51-J flight later this year. STS 51-J, a dedicated Department of Defense mission, will be the first flight of the Orbiter *Atlantis*.

# Notes from the Solar System



## Samplings from the Lunar and Planetary Science Conference

### A Neptunian detective story

It is a saga of astronomical detective work resulting in the discovery of what appears to be an arc of particles—not a ring system—in orbit around the planet Neptune. This discovery raises the possibility that the particle cloud may slowly be forming into a new moon.

The discovery came after repeated uses of the stellar occultation technique, where astronomers use high speed photometers to observe a star as it passes behind a planetary system. "The star acts as a distant beacon to trace material near the planet and in the planet's

atmosphere." The rings of Uranus were revealed in 1977 through this technique, and astronomers "immediately sought to apply the same technique to a search for material around Neptune."

The first good opportunity came in 1981, but no ring material was found—with one exception. University of Arizona scientists at observatories near Tucson recorded an 8-second interruption of light, ostensibly indicating that the star had been occulted by material around 75,000 kilometers from Neptune's center (about three

planetary radii). However, a continuous ring system like the Uranus or Saturn systems would have to interrupt the light twice—once when the star went inside the ring, and once when it came back out. This didn't happen.

In July 1984, new data came from three telescopes at two locations in Chile. All three recorded strong occultation events when the star was approaching the planet, at a distance of about three Neptune radii. The find was of a segment of occulting matter about 100 kilometers long, about 15 kilo-

### Solving a riddle while Jupiter bound

The possible flyby of the asteroid Amphitrite by the Galileo probe could help resolve a controversy which "cuts to the very heart of asteroid and meteorite research," the authors say.

No spacecraft have as yet visited the asteroids. A recent study of the trajectory of the Galileo probe revealed that it could be targeted to pass close to Amphitrite. A decision to exercise the flyby option will be made after Galileo is launched from the Shuttle in May 1986. Arrival at Amphitrite would be in December 1986.

The controversy stems from two schools of thought on the interpretation of spectral data obtained by studies of a common asteroid type, the spectral class S. Amphitrite, an S-type asteroid, would thus be an important candidate for closeup study by Galileo.

If one interpretation of spectral data from S-asteroids is correct, then the following would be true: 1.) the most common meteorites correspond to the most common asteroids; 2.) asteroid spectra are highly non-representative of the bedrock beneath; 3.) S-type asteroids were only slightly heated and metamorphosed during the early eons of the Solar System. If the second school of thought is correct, then radically different interpretations would follow: 1.)

the most common meteorites have no known parent body in the asteroid belt, and the most common asteroid type is the source of some of the rarest meteorite types; 2.) asteroid regoliths are merely pulverized bedrock and asteroid spectra are easily interpretable; 3.) S-type asteroids were strongly heated and melted, but the segregation of silicate and metal components was still incomplete when the heat source decayed and the melt solidified.

Since the asteroids could represent a compositional transition between the inner and outer planets, scientists are anxious to study them in more detail. "The asteroids probably represent remnants of the population of small bodies which accumulated to form the planets, and preserve an otherwise lost intermediate stage between dust and planets," the paper says. In this respect, a Galileo flyby is important, and an added benefit is that "the Amphitrite encounter is the right mission with the right instruments to the right asteroid at the right time to fill major gaps in our knowledge of asteroids."

From "Asteroid Amphitrite... The Possible Galileo Flyby," by Jeffrey Bell, Jonathan Gradie, Ray Hawke and Thomas McCord, Hawaii Institute of Geophysics; and Michael Gaffey, Rensselaer Polytechnic Institute.

### The twisting swirls of Barsoom

To the mind's eye images of what the surface of Mars must be like, add now a picture of frequent dust devils which may be as intense as tornadoes on Earth.

That is the conclusion of the authors following recent studies of Viking Orbiter imagery.

"Mars is dry and dusty," the authors write, "and the storms are probably analogous to terrestrial dust devils, but their size indicates that they are more similar to tornadoes in intensity. They occur at locations where the soil has been strongly warmed by the Sun, and where the surface is smooth and fine grained. These are the same conditions that favor dust devils on Earth. Warm gas from the lowest atmospheric layer converges and rises in a thin column, with intense swirl developing at the edge of the column. In desert regions on the Earth, dust devils usually reach heights of only a few hundred meters and although they are interesting phenomena, the vortices are not of great importance.

"On Mars the situation is different. In the absence of liquid

water, wind erosion is a major geological force, and transport of dust and soil by wind is the major process that changes the face of the planet. The newly discovered storm systems may produce wind speeds in the same class with tornadoes, and can clearly lift large quantities of dust from the surface. Geologists have been puzzled by many long markings on the surface of Mars where layers of dust appear to have been scoured away, and it now seems likely that these markings are the tracks of dust vortices, much as the track of a tornado leaves a long narrow arc of destruction across the Earth."

The storms are not rare, the authors say. One series of images shows vortices visible during four different summer days in the northern hemisphere. "In one area a mosaic of images shows 97 vortices in a three day period. This represents a density of vortices of about one in each 900 square kilometers."

From "Dust Devils on Mars," by P. Thomas and P. Gierasch, Laboratory for Planetary Studies, Cornell University.

"Current theories of the formation of planets and the shaping of their surfaces indicate that two planets of similar size and composition, like Ganymede and Callisto, should be subject to the same geologic process both inside and out and should have similar surface features. . . Explaining how Callisto came to have none of the features (except craters) so common on Ganymede is comparable to explaining how one tract house had no water inside during a major flood while the neighboring house was filled to a depth of, say, 8 feet."

—Steven Croft. "Ganymede and Callisto: Beauty is Only Skin Deep," a paper which presents a geologic model for "marginal melting" that provides an explanation for the differences between the two Galilean satellites of Jupiter.

### Comet Halley heats up

The long-awaited return of Comet Halley has begun, and astronomers have already observed the large "dirty snowball" begin to go through changes as it approaches the Sun.

The Comet's periodic visits to this part of the Solar System have been consistently chronicled throughout recorded history. For the first time, however, mankind has reached a technological stage where it can send robots to study the comet close up. Already, four spacecraft have been dispatched from Earth; two more will follow in mid-1985. This paper discusses dust emissions of the comet as it approaches the Sun, important information for determining the flyby strategy of the

European Giotto probe.

The spacecraft "armada" enroute or nearing launch for Halley encounters consists of NASA's ICE spacecraft, two Russian VEGA probes and the Japanese MS-T5 spacecraft. Two additional spacecraft, the European Giotto and another Japanese Planet-A probe, will be launched in mid-1985 to join the fleet. In addition, the ASTRO experiments aboard Shuttle mission 61-E will study the comet from low Earth orbit, and NASA's Pioneer Venus orbiter will turn its attention to Halley as it swings around behind the Sun next spring.

Before 1984, Halley "had a star-like appearance and no direct sign of evaporation activity," the

authors write. By the end of 1984, however, an observation from Calar Alto, Spain showed a halo formed around the comet of 3,000 to 10,000 kilometers in diameter. "The formation of a halo indicates the onset of evaporation of cometary ices," the authors state. "The study of dust emissions from Comet Halley will eventually determine the flyby strategy of the Giotto spacecraft by taking into account the distribution of dust in the vicinity of the nucleus and the associated hazard for the space mission."

From "Dust Emission of Comet Halley. . ." by E. Grün and U. Graser, Max-Planck Institute, and G. Schwehm, Lutz Massonne and Jürgen Fertig, European Space Operations Centre.

"Each year as the Earth orbits the Sun, it collides with 10,000 tons of extraterrestrial material, mostly debris from the disintegration of comets and asteroids. Only a tiny fraction of this material is found on the ground as conventional meteorites. Most of it invisibly settles to Earth's surface as dust particles smaller than a millimeter in size. . . Comets are the most important source of dust in the Solar System and they are probably the major source of extraterrestrial dust that is collectable at the Earth's surface. . . Comets are believed to be samples of the original building blocks that the outer planets Uranus, Neptune and Pluto formed from."

—M. Maurette, et al. "Mining Cosmic Dust from the Blue Ice lakes of Greenland," a paper suggesting methods for collecting cosmic dust from unique natural receptacles, where concentrations are thought to be the highest on Earth.



# Roundup Swap Shop

All Swap Shop ads must be submitted on a JSC Form 1452. The forms may be obtained from the Forms Office. Deadline for submitting ads is 5 p.m. the first Wednesday after the date of publication. Send ads to Roundup, AP3, or deliver them to the Newsroom, Bldg. 2 Annex, Room 147. No phone in ads will be taken.

## Property & Rentals

For sale: Seabrook/Wildwood, 4-2-2, FPL, ceiling fans, cathedral ceiling, excellent condition, \$95,000, assume loan, \$8,000 equity. Call Huysman, x6557, 474-7020 or 471-8025.

For sale: Lifetime vacation condo on Lake Conroe with exchange privileges to international condos. Call Don, 280-6307 or 554-6205.

For sale: Waterfront lot on 244-acre lake with access to excellent bass fishing in Brazoria county. Call Don, 280-6307 or 554-6205.

For rent: New Orleans condo in French Quarter, Jazz Festival Week, April 26 to May 3, sleeps four plus. Call Faye, 486-4945 or 280-3695.

For lease: Scarsdale, 3-2-1, carpeted, refrigerator, lg. fenced yard, \$475/mo. Call George, x3305 or 332-1607 evenings.

For rent: Lake Tahoe condo, available May to June 1985, exact dates negotiable, sleeps six, \$500/wk. Call Minnie, x2228 or 474-5610 after 5 p.m.

For lease: University Green townhome, new 3-2-2A w/loft and courtyard, across from Credit Union, all appliances, security system, no pets, prefer adults only. Call 488-2392.

For sale: Dickinson, 2-1, 1983 mobile home, 14' x 64' in adult section of park w/pool, extras, energy efficient, \$750 and assume \$297/mo. Call Garner, x5827 or 534-3499 evenings.

For sale: Four cottages, fully rented, near Galveston Bay, \$60,000, \$6,000 down, balance of \$54,000 to be financed at 11% for 20 years. Call 482-6278.

For lease: 2-2 waterfront condo, FPL, pool, pier, completely furnished, includes furniture, linens, dishes, plants, BBQ, \$800/mo. Call Marion Bell, 481-2157.

For sale: League City, commercial lot, 1.7 acres, near elementary school. Call George, x3305 or 332-1607 evenings.

For lease: Barringer Knoll, off Hwy. 3, 2 BR in a fourplex, W/D connections, pool, clubhouse, cable TV, ceiling fans, \$350/mo. Call 326-4395 after 5 p.m.

For sale or lease: CLC 3-2-5-2 (carport), completely renovated, new paint, carpet, tile, close to JSC, will consider lease/purchase option, \$65,000, \$650/mo. Call Ed White, x5489 or 480-0273.

For sale: University Green patio home, 2-2-2, split BR design, detached garage, utility room, cathedral ceiling, FPL, microwave, pool access, 2 years old. Call 488-0500 or 480-6516 after 5 p.m.

For lease: Pipers Meadow, 3-2-2, dining, FPL, cathedral ceiling, nice, \$575/mo. Call 488-0500 or 480-6516 after 5 p.m.

For sale: Horseshoe Lake Estates, Romayor, 3-1, AC, fully furnished, one acre, on small fishing lake by Trinity River, Hwy. 105 between Cleveland and Rye. Call Susan Peterson, x3138 or 479-5594 after 5 p.m.

For lease: CLC 1BR condo, microwave, appliances, W/D connections, FPL, tennis, exercise room, one-half month free. Call Jim Briley, x2546 or 488-7901 after 5 p.m.

For rent: Galveston Gulf Front condo, treat yourself to a two day to one month vacation, completely furnished, low rates. Call Nussman, 488-7762.

For lease: Baywind I, 2-2-2, split plan, FPL, W/D connections, ceiling fan, built-in bookshelves, \$425/mo. plus deposit. Call Roberta, x5441 or 486-9673.

For sale: Fairmont Park, 3-2-2, formal dining, FPL, C/A, 8% VA assum., fenced back yard, cathedral ceiling, two ceiling fans. Call Hendrickson, x4053 or 470-2293.

For sale: Forest Bend, 4 or 3-2.5-2, pool, six ceiling fans, gameroom, wet bar, trees, no flooding, will pay points, \$76,500. Call 482-4145.

For lease: NASA area, 2-2, custom decorated, ideal for roommates, \$480/mo. plus deposit. Call Hank, x2285 or 488-3178.

For sale: 2 BR mobile home, large living room, roomy kitchen, separate dining room, in excellent shape, would make nice first home or lake house, \$19,000 OBO. Call 585-3922.

For lease: Executive townhouse, The Landing, 2-2-2 plus study down, two story, large patio, 25-foot boat slip, all utilities paid, deposit negotiable, no children under 12, \$800/mo. Call 333-9254 or 333-9745.

For lease: Pearland/Dixie Hollow, 3-2-2, split bed room, fence, FPL, new paint, clean, utility room, formal dining, front porch, \$550/mo. Call 482-6609.

For sale: Middlebrook II 4-2-2 Playa Contemporary, open floor plan, vaulted ceiling in living area, master bath has his and her lavatories, closets, fenced, \$92,900. Call 488-7387.

For sale or lease: La Porte 1 BR condo, nice, good sized rooms, \$25,000

or \$350/mo. Call 480-6325 evenings.

For lease: Baywind II, 1 BR condo, FPL, kitchen appliances, W/D connections, pool and exercise room, reasonable. Call Jim Wiltz, x5437 or 944-0451 evenings.

## Cars & Trucks

1982 AMC Spirit GT, 6 cyl., 4 spd., AC, special handling pkg., R.C. mirrors, 25-28 MPG, \$4,000 OBO. Call Don, x3078.

For sale: 1982 Ford Bronco, 5 year/50,000 mile warranty, \$8,900; 1975 Plymouth window van, good running condition, V8, standard, \$1,100. Call John, x5301 or 482-8457.

1977 customized Dodge maxi-van, AC, PB, PS, auto, AM/FM stereo, CB, more, \$7,500. Call Bob, x3445 or 921-1715 evenings.

1980 Citation, AC/PS/PB, 8-track. Call 280-0046 after 5 p.m.

1980 Buick Century Ltd., 4 dr., PB, PS, AM/FM/cassette, AC, tilt steering, vinyl top, wholesale price. Call 481-2335 after 5:30 p.m.

1978 MGB, low miles, no rust, near mint condition, \$2,750 firm. Call 479-0038 after 6 p.m.

1983 Ford Thunderbird Turbo Coupe, loaded, \$9,200 OBO. Call Glen Stromme, x5665 or 280-8644.

1956 Buick Special Riviera Coupe, needs paint, otherwise is in good cond., original owner, best offer. Call Paul, x2968.

1981 Pontiac Phoenix, V6, PS, PB, AC, AM/FM/cass., extras, 7,000 miles, runs well, \$3,000 OBO. Call Leo, x4045 or 554-6460 evenings.

1976 VW Sirocco, runs well, looks good, needs minor front end work, \$900 OBO. Call Paul, 482-4430 or 333-6857.

1983 Nissan pick-up, light blue, excellent condition. Call 326-2074.

1977 Thunderbird, fully loaded, must sell. Call Billie, 482-4365 after 5 p.m.

1983 Jeep CJ7 Laredo, \$8,500 OBO. Call Jo Ann, x7253 or x7484.

1984 Fiero SE, loaded, auto, tinted windows, front end cover, extended warranty, excellent condition, \$9,500. Call 471-1981 or 280-4088.

1973 Dodge Maxi-Van, AC, PB, PS, 360 engine. Call 480-1340 after 6 p.m.

1967 Dodge Dart, new tires, doesn't run, cheap, will sell all or parts. Call Zack Byrns, x6247.

1973 Volvo 164E, good cond., new brakes, battery, alternator, tires, paint, rebuilt auto trans., \$2,700. Call 333-0813 or 996-9715 evenings.

1972 Firebird, new trans., timing chain, cover, needs tuneup and tags, \$650. Call RT, x5324.

1980 AMC Spirit, auto, AM/FM/cass., tilt/PS, 2 dr. hatchback, 6 cyl., 63K, some body damage but runs well, \$1,250. Call Jolene, x5951 or 559-1122.

1977 Buick Electra, PS/PB/PW, 107K miles, excellent condition, \$2,975. Call 337-3683 evenings.

1977 T-bird, blue w/white vinyl top, good condition, \$950; 1975 Corvette, red, sharp, \$5,500. Call 481-0679.

1982 Datsun 200SX hatchback, deluxe XL pkg., sunroof, 5-speed, AC, AM/FM/cass., computerized talking warning system, clean, great mileage, \$6,950. Call Ronald Arthur, x5271 or 332-1289.

1982 Chevy Van, Travel Quest conversion, loaded, grey/grey interior, auto., cruise, 40K miles, \$13,500. Call 280-8221 after 5 p.m.

1976 Ford Elite, \$1,000. Call Mary Ramirez, x2078 or 538-3672.

1978 BMW 733i, loaded, good condition, \$10,900. Call 326-4395 after 5 p.m.

1969 Scout, 4 wd w/tow bar, wench, \$750. Call 332-1161 after 5 p.m.

1976 Dodge Dart, 80K miles, auto, AC, AM/FM/cassette, good running condition, \$900 OBO. Call Steve, x4545.

1977 Chevy Monza, PS, PB, auto, yellow, sporty, body nice, engine needs rings and upper oil seal, 4 cyl., current license, inspection, \$375; 1977 Chevy Vega, not running, \$175. Call Kilbourn, x4544 or 482-7879.

1973 Toyota Corona, station wagon, needs engine, \$150. Call Kilbourn, x4544 or 482-7879.

1981 Datsun 310-GX, 35K miles, 32 MPG, AC, AM/FM/cassette, good condition, \$3,900. Call Marie, x3905 or 338-2336.

## Boats & Planes

C-150, \$32/hr. wet or 10 hr block \$300, Clover field. Call Paul or Kate, 333-6857 or 482-4430.

Fabuglas boat, open bow, walk-thru windshield, tri-hull, 85 h.p., 35 mph, galv. trailer, mint cond., \$4,500. Call Keith, x3501.

Ouachita aluminum canoe, 15 ft., double-ended w/two thwarts, four ribs,

\$150. Call George Guthrie, 946-7848.

Sailboat 25 ft. O'Day, incl., new main & genoa, standing & running rigging, exterior paint, 1982 7.5 HP Honda, \$9,000. Call 480-6863.

## Cycles

1978 Honda Hawk motorcycle, 14K miles, recently rebuilt engine, runs well. Call Hendrickson, x4053 or 470-2293.

1980 Suzuki 65806, clean, full dress, w/vetter equipment, AM/FM, black/silver, \$1,700 firm. Call RT, x5324.

1975 Honda 750F Supersport MC, low mi., excellent condition, \$1,000. Call Bullock, 334-4949.

1980 Honda XL-500, 1,500 mi., excellent condition, \$1,500. Call Richard, x5612 or 498-5259.

1974 Suzuki, 185 cc, electric start, low mi., needs tuneup, \$200. Call Jack, x2285.

1981 KZ650 CSR, blue, excellent cond., w/detachable carrier, shield, crash bars, highway pegs, \$1,250. Call Frank, x4752.

1975 Honda CB360w/fairing, lug/back rest, saddle bags, more, \$100. Call Hank, x3285 or 488-3178.

## About submissions ...

Civil Service and contractor employees interested in advertising in the Roundup Swap Shop are reminded that submissions must be placed on a JSC Form 1452, available from the Forms Office, Distribution Operations. The one group excepted from this rule is NASA retirees, who may submit the ads as always, preferably on an 8 1/2 x 11 sheet of paper. For all other advertisers, a Form 1452 is necessary, and can be obtained through normal requisition procedures. The cooperation of our advertisers in following these guidelines is greatly appreciated.

## Audiovisual & Computers

Commodore 64, disc drive, 1526 printer, 1702 color monitor, auto dial modem, spread sheet, word processor, more. Call R. Martin, 332-0023.

RCA 100% solid state B & W T.V., 19", rich wood-grained, acrylic finish, good condition, \$90. Call Norm, x4121.

Personal computer, DECVT-180, dual floppies, LA-50 printer, CPM, word processing, basic and multi-plan, \$2,000. Call Dan Danley, 280-7413 or 996-0115.

Microsoft PASCAL for MS-DOS, complete with documentation, never used, requires 160K memory and two disc drives, \$100. Call Sharon, x2313 or 333-2431.

VIC 20, 9 games, programmer's guide, teach yourself basic, three extra memory cartridges, programmer's aid cartridge, \$200. Call 644-0315 after 4:30 p.m.

## Household

Royal Doulton China, Old Colony pattern, six-piece place setting including small serving platter, never used, best offer. Call Linda, x7250 or x7251.

Twin bed and mattress/box springs, white, French Provincial, 4-poster, excellent condition, \$100 OBO. Call Trish, x2918.

Sealy Posturepedic mattress, never used, still in plastic, does not fit antique bed, \$200. Call 532-3408 evenings.

Whirlpool washing machine, white, works fine, \$50. Call 326-3370.

Speed Queen washer and dryer, dryer needs minor repairs, \$100 for both. Call Lew, 488-8796.

Jenny Lind baby bed w/ toddler conversion kit, \$85; White and yellow, three piece, wrought iron ice cream parlor set w/30 in. table, \$75. Call Nussman, 488-7762.

Antique oak trestle table w/two leaves, \$250. Kimball upright piano, 90 yrs. old, needs refinishing, \$150. Call 333-0813 or 996-9715 evenings.

Sofa w/built-in sleeper, \$70. Call 480-1340 after 6 p.m.

Custom hardwood bar, L shaped, approx. 5 ft. long, \$150. Call Bud Chatterley, x3701 or 480-9363.

Convective oven, electric, 120V, \$40. Call 481-0468 after 6 p.m.

Solid maple butcher block table tops, 24 x 30 and 30 x 30 sizes, birch wood chairs. Call Ray, x5257 or 554-2908.

Pre-1945 GE refrigerator, compressor unit on top, in working condition. Call Ray x5257 or 554-2908.

Two matching living room chairs, traditional style, good condition, \$30 each. Call 820-2814.

## Pets

AKC registered cocker spaniel puppies, six weeks old, blonde, playful. Call 334-6697 after 6 p.m.

AKC registered toy and miniature poodles, shots, groomed, champion bloodlines, several colors. Call 944-0945.

AKC registered female Dalmation, 4 mos. old, all shots, liver spots, w/kennel, \$100. Call 333-0755 or 482-5921 evenings.

## Wanted

Housemate to share Middlebrook 3-2-2, \$295/mo. plus half utilities, gets master bedroom and private bath. Call Jim, x5378 or 480-5129.

Atari 400 computer, working or not. Call Steve, x3538 or 488-7610.

Car pool from Deer Park to JSC, working hours are 8 to 4:30 p.m. Call Carolyn, x5996.

Nonsmoker for carpool from Rayburn/Parkview to bldg. 30, 8 a.m. to 4:30 p.m., have reserved space close to bldg. 30. Call Cathy, x4401.

Head for 1098 cc Morris Minor or MG Sprite. Call 333-2395.

Electric trains. Call Don Jeffers, x2449.

Copy of Henry Cooper's book, "13: The Flight That Failed," copy of congressional (House) report, "The Apollo 13 Accident" (June 16, 1970.) Call Dave, x2838.

## Miscellaneous

Camper top for small pickup w/ louvered windows, \$150. Call Plauche, x2594.

Gun case w/glass doors, holds twelve guns, \$200. Call 482-6660.

Rent my motor home by day or week.

self-contained w/onboard generator, roof air, comforts of home on wheels. Call Dave, x5111 or 480-0202 after 6 p.m.

Shop Smith w/ bandsaw and joint accessories, \$150 OBO; Sears 10" radial saw, \$275.

JSC Space Shuttle and Ford Aerospace jackets, S.M.L., many colors. Call Barbara, 280-6115 between 11:30 and 12:30 p.m.

IBM electric typewriter, good condition, \$175; sailing ship model, collectors item, \$50; 100 National Geographic, \$25; Walnut end table w/ magazine rack, \$25; Marmink full length fur coat, size 14, \$650. Call 488-5564.

Save wear and tear on both you and your car. Vanpool from Meyerland Plaza to JSC, \$49.95/mo. Call Richard Heetderks, x3583.

Toro 21" lawnmower, self-propelled, fair condition, runs but needs tune-up, \$40. Call 481-0468.

Wire on spools suitable for telephone or electronic hookup, large assortment. Call Jim, 486-8564 evenings.

Lawnmower, fert. spreader, and misc. yard working tools. Call Keith, x3501.

Parts available for 1978 Honda Hawk (used), one-third of new price, limited supply. Call Zack Byrns, x6247 or 925-3945.

Brand-new six-piece, people lounge sectional sofa, blue w/beige stripe, plush, \$1,300. Call 326-2074.

Gray Seruliah mink cape, mint cond., appraised at \$1,500, best offer. Call Paul, x2968.

Two excellent Ford van bench sets, blue vinyl, \$150 each or \$270 for both. Call John, x5301 or 482-8457.

Aristocrat Royal elite typewriter w/correction ribbon, \$75. Call 644-0315 after 4:30 p.m.

Goodyear Viva fiberglass radial, FR 78x15, not used; 1984 World Book Encyclopedia, new in box, \$375. Call Kilbourn, x4544 or 482-7879.

Ward's exercise set, with weights and bench, \$50. Call Sashi, x3929.

## Bulletin Board

### JSC Picnic tickets to go on sale

"Pursue a Non-trivial Picnic" is the theme for this year's JSC annual picnic event set for May 4 at the Gilruth Recreation Center. The day's festivities will include clowns, face painting, a palmist, belly dancer, bingo, and a dunk tank. Also featured are two square dance groups, country-western and rock bands for the adults and teenagers and rides and games for the kids. A Borden ice cream truck will be serving from 11 a.m. to 5 p.m. and a Texas style barbecue with all the trimmings will be served from noon to 3 p.m. Because parking lots near the Rec Center are likely to be full early on, a shuttle bus will run from parking lots near the JSC fire station to the picnic grounds. Tickets for the picnic will go on sale the second week in April at the Bldg. 11 Exchange Store. Those interested in participating in the "Almost Anything Goes" team competition must attend pre-picnic preliminaries. For more information on that event, call Helen Munk at x3594.

## Cookin' in the Cafeteria

### Week of March 18—22, 1985

**Monday** — Chicken & Rice Soup; Wieners & Sauerkraut, BBQ Ham Steak, Steak Parmesan, Beef & Macaroni (Special); Green Beans, Carrots, Au Gratin Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday** — Tomato Soup; Potato Baked Chicken, BBQ Spare Ribs, Mexican Dinner (Special); Squash, Broccoli, Ranch Beans, Spanish Rice.

**Wednesday** — Seafood Gumbo; Liver & Onions, Baked Turbot, BBQ Ham Steak, Baked Meatloaf w/Creole Sauce (Special); Beets, Brussels Sprouts, Green Beans, Whipped Potatoes.

**Thursday** — Beef & Barley Soup; Chicken & Dumplings, Corned Beef w/Cabbage, Smothered Steak w/Cornbread Dressing (Special); Spinach, Cabbage, Cauliflower au Gratin, Parsley Potatoes.

**Friday** — Seafood Gumbo; Pork Chop w/Yam Rosette, Creole Baked Cod, Tuna & Salmon Croquette (Special); Brussels Sprouts, Green Beans, Buttered Corn, Whipped Potatoes.

### Week of March 25—29, 1985

**Monday** — Cream of Celery Soup; Braised Beef Ribs, Chicken a la King, Enchiladas w/Chili, Italian Cutlet (Special); Navy Beans, Brussels Sprouts, Whipped Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday** — Beef & Barley Soup; Turkey & Dressing, Country Style Steak, Stuffed Cabbage (Special); Corn Cobbette, Okra & Tomatoes, French Beans.

**Wednesday** — Seafood Gumbo; Catfish w/Hush Puppies, Roast Pork w/Dressing, Pepper Steak (Special); Broccoli, Macaroni & Cheese, Stewed Tomatoes.

**Thursday** — Cream of Tomato Soup; Beef Tacos, BBQ Ham Slice, Hungarian Goulash, Chicken Fried Steak (Special); Spinach, Pinto Beans, Beets.

**Friday** — Seafood Gumbo; Liver & Onions, Deviled Crabs, Roast Beef w/Dressing, Tuna & Noodle Casserole (Special); Whipped Potatoes, Peas, Cauliflower.